

REMARKS

The present amendment is in response to the Office Action dated September 23, 2004. Claims 1-9 and 18-23 are now present in this case. Claim 5 is amended. New claims 18-23 have been added.

Claims 1, 8, and 9 stand rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 52501822 Bento, *et al.* The applicants respectfully disagree with the assessment of Bento and its applicability to the claimed invention. The Office Action cites Figure 3 of Bento as disclosing a filtration chamber which allows passage of acids and blocks the passage of sugars. However, Figure 3 of Bento is merely a detailed illustration of the membrane separation system illustrated in Figure 2. (See column 9, lines 62-63.) It should be noted that the overall process illustrated in Figures 1 and 2 is that of an ethanol production system based on dry milling of corn. (See column 1, lines 7-60.) In the ethanol production system, the starch in corn is converted to sugar and fermented to produce a "beer". (See column 1, lines 7-11.) With the proper selection of yeast for the fermentation process, a high yield of ethanol in the range of eight percent – twelve percent may be produced. (See column 8, lines 65-68.) It is well known that this process produces lactic acid and glycerol as side products. (See column 1, lines 11-14 and column 8, lines 67-68.) The entire process illustrated in Bento, including the process of Figure 3, cited in the office action, is a technique for the recovery of the lactic acid in glycerol.

The fermentation and distillation process that produces ethanol occurs prior to the filtration process illustrated in Figures 2-3. Those skilled in the art will appreciate that the fermentation/distillation process produces a high grade of ethanol and virtually eliminates available sugar from the process. Thus, the "thin silage (See Figure 2) that is provided to the membrane separation system 100 contains no sugars and only a small amount of lactic acid. This is further illustrated in the table in column 9, lines 55-60. Notably, this table does not include sugars.

Bento teaches directly away from the claimed invention by disclosing a system in which sugar is converted to ethanol and removed from the system prior to the filtration process illustrated in Figure 3. The input feed line coupled to the filtration chamber in Bento contains products illustrated in the table of column 9, but does not

include the mixture of “water, acids and sugars, as recited in claim 1. Furthermore, the nanofiltration membrane in claim 1 allows “passage of the acids in the mixture while substantially blocking passage of the sugars in the mixture.” Bento discloses no such structure or function. As noted above, the sugars are converted to ethanol and thus removed prior to the filtration process. Accordingly, claim 1 is clearly allowable over Bento. Claims 8 and 9 are also allowable in view of the fact that they depend from claim 1, and further in view of the recitation within those claims.

Claims 1-3, 5, and 7 stand rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 55542272 Kwok, *et al.* The applicants respectfully disagree with the assessment of Kwok and its applicability to the claimed invention. The office action states that “Kwok does not specify if the acids would pass through the membrane or not.” (See Office Action, page 3). The reason Kwok does not specify whether acids would pass through the membrane is that no acids are present in any part of the system described by Kwok. Kwok is directed to a technique for manufacturing crystal sugar from aqueous sugar, such as sugar beet juice or sugar cane juice. No acid is used in the process, and thus, there is no contamination of the sugar product with acid and, thus, there is no need for an apparatus to separate the acids and sugars. One of skill in the art would not look to Kwok to provide any guidance in processing sugar contaminated acid, which is the subject matter of claim 1.

Kwok is directed to techniques for eliminating contaminants that cause discoloration in the crystallized sugar. The Office Action states that Kwok teaches a nanofiltration system in column 5, line 17-26. The cited section of Kwok is primarily directed to a decolorization column using an adsorbent to remove color contaminants. In one line, Kwok mentions that decolorization may be accomplished using ultra filtration or nanofiltration of the syrup. However, even if one assumes that the decolorization column 25 were implemented as a nanofiltration assembly, the system of Kwok does not teach or even suggest the structures recited in claim 1. The input feed line to the decolorization column 25 in Kwok contains remelted crystallized sugar. There is no teaching or suggestion that the input feed line contains “a mixture of water, acids and sugars” as recited in claim 1. Furthermore, the filtration membrane recited in claim 1 is configured to allow “passage of the acids in the mixture while substantially blocking

passage of the sugars in the mixture.” The colorization column 25 in Kwok does not teach or suggest a process by which sugar is blocked. Indeed, the output of the decolorization column 25 is sugar that is delivered to a recrystallization unit 26. A filtration system that passes sugar to the output, such as described in Kwok, teaches away from the invention of claim 1, which passes acids in the mixture, but “substantially blocking passage of sugars in the mixture.” Furthermore, as noted above, there are no acids in the process described in Kwok and thus no inherent filtration of acids by the decolorization column 25. Accordingly, claim 1 is clearly allowable over Kwok.

Claims 2, 3, 5, and 7 are also allowable in view that they depend from claim 1, and further in view of the recitation in each of those claims. For example, claim 2 of the pending application recites “a chromatographic unit having a first input to receive water and a second input to receive a mixture of water, acid and sugar.” The unit performs a partial separation of acids and sugars and has “a first output to supply the separated sugar and a second output coupled to the input feed line to supply the mixture of water, acids and sugars to the filtration chamber.” The Office Action cites a chromatographic unit 32 (See Figure 2) and states that “claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function.” However, the Office Action appears to be reciting function rather than structure in rejecting claim 2. Specifically, claim 2 recites an output from the chromatographic unit that is coupled to the input feed line of the filtration chamber recited in claim 1. In contrast, the chromatographic unit 32 in Kwok is essentially an ion exchange column whose output conduit 34 is coupled to a storage tank 36 and used for replenishing the softening column 15 the chromatography column 32 also has an output conduit 35 that provides a sugar enriched liquid effluent. (See column 5, lines 59-65.) However, Kwok is completely silent as to the ultimate destination or connection for the conduit 35. This is in sharp contrast to the specific structural arrangement recited in claim 2. Thus, claim 2 clearly recites structural arrangements of the components that are not taught or suggested by Kwok.

Similarly, claim 3 recites a feedback line coupled between the nanofiltration unit and the chromatographic unit wherein the feed back line returns “concentrate sugar to the chromatographic unit for further separation.” The Office

Action cites either line 28 or 31 as teaching such a feedback arrangement. This is not correct and appears to simply illustrate the function of a feedback line rather than the specific structural arrangement of the feedback line recited in claim 3. The output of the recrystallization unit 26 in Kwok is a conduit 27 to deliver crystal white sugar and a conduit 28 to deliver crystallization syrup. (See column 5, lines 27-29.) The concentrated crystal sugar is extracted through conduit 27. It is recrystallization syrup that is recycled to the crystallization unit 22 by feedback line 28. This is not coupled to the chromatographic unit to return concentrate sugar to the chromatographic unit for further separation, as recited in claim 3. The feedback line 31 is even more remote from the chromatographic column. Kwok describes a technique by which the molasses from storage tank 36 may be delivered via a conduit 31 to regenerate the resin in the softening column 15. (See column 5, lines 36-46.) Thus, the conduit 31 does not deliver concentrate sugar to the chromatographic unit, but delivers molasses to regenerate an ion exchange column. This does not teach or even suggest the feedback line recited in claim 3.

Claims 4 and 6 are rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Kwok and Bento. The applicants respectfully disagree with this assessment. The inapplicability of each of these references individually has already been discussed in detail above. The combination of references does not overcome the serious deficiency in the individual teachings. Furthermore, the combination of references suggested in the Office Action is neither taught or suggested by either reference and would be unlikely. The two cited references are directed to different technologies. It should be noted that the international and U.S. classification of Kwok is different from the international and U.S. classification for Bento. Furthermore, it should be noted that the fields of search for each patent are completely different. It is extremely unlikely that one skilled in the art having a single one of the references cited in the Office Action would seek to combine it with a reference from a totally separate technology area. The applicants kindly request that the Examiner point to a specific location within either of the references that suggests the combination cited in the Office Action.

Even if one were to combine the references in the manner suggested in the Office Action, they do not teach the invention recited in claims 4 and 6. Specifically, claim 4 includes a pre-filtration chamber and recites *inter alia* “an input feed line containing a mixture of water, acids and sugars, the input feed line coupled to the pre-filtration chamber input connection” as well as “an output line coupled to the second input of the chromatographic unit. However, the Office Action appears to cite filter functions and completely ignore the structural distinctions that result in substantially different functions between the claimed invention and the cited references. It is noted that the input to the chromatographic unit in Kwok is the output from the crystallization unit 22. Kwok does not teach or suggest a pre-filtration chamber coupled to the input of the chromatographic unit. The Office Action states the Bento “teaches a nanofiltration membrane which allows the passage of acids and prevents the passage of sugary material (See fig. 3).” This is not correct. As noted above in the discussion of Bento, the filtration system in Figure 3 of Bento does not involve the filtration of sugars at all. The sugar has been converted by an earlier process into ethanol and distilled away prior to the operation of the membrane separation unit 100 to remove lactic acid and glycerol. (See Figure 2). Thus, the combination of references do not suggest the pre-filtration apparatus recited in claim 4. Claim 6, which depends from claim 5, recites *inter alia* “a sugar processing system coupled to the first output of the chromatographic unit to receive the separated sugar therefrom.” In claim 6, it is recited that “the sugar processing system is a fermentation/distillation system and processes the sugar into ethanol.” The structure and operation of the systems in Kwok and Bento do not teach or suggest the system recited in claims 5 and 6. The chromatographic unit 32 in Kwok produces molasses at its output. The molasses is used to regenerate the ion exchange column 15. (See column 5, lines 36-46.) Thus, the chromatograph does not separate sugars and there is no sugar processing system coupled to the output of the chromatographic unit in Kwok. The fermentation/distillation system in Bento occurs well in advance of the filtration system (*i.e.*, the membrane separation system 100 of Figures 2-3) that are used to recover the lactic acid and glycerol. Neither Kwok or Bento, taken alone or in combination recite a structure wherein the output of a chromatographic unit is coupled to a sugar processing unit, which comprises a fermentation/distillation

system. Accordingly, claim 6 is clearly allowable over the combination of references cited in the office action.

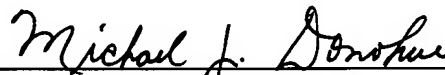
New Claims 18-23 are also allowable over the cited references.

In view of the above amendments and remarks, reconsideration of the subject application and its allowance are kindly requested. If questions remain regarding the present application, the Examiner is invited to contact the undersigned at (206) 628-7640.

Respectfully submitted,

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A handwritten signature in cursive script, reading "Michael J. Donohue", is written over a horizontal line.

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